

NORTHEAST PUBLIC POWER ASSOCIATION

# SUBSTATION II PROGRAM

**SEPTEMBER 5 – 8, 2023**

**SEPTEMBER 19 – 22, 2023**

**OCTOBER 10 – 13, 2023**

**OCTOBER 24 – 27, 2023**



Building on the success of Substation I, NEPPA is pleased to offer a completely redesigned Substation II Program which is held 3.5-days/week for 4 weeks/year.

Substation II expands on Substation I and moves into protection and controls, understanding operations, schematics, and diagrams, testing and test results interpretation of substation equipment. Upon successful completion of the Program, students are awarded a Certificate of Completion.

In addition to in-class lecture, the Substation II Program incorporates hands-on application of concepts and testing, building, and manipulating a relay panel, and weekly testing including a final exam to demonstrate knowledge and comprehension of the course content.

Each Friday of each session will be a half-day conducted virtually for review and testing.

## WHO SHOULD ATTEND

This course is designed for:

- Lineworkers or operations employees
- Substation Technicians
- Employees or Supervisors transitioning from other departments
- Engineers
- Construction Supervisors
- Project Managers

## LEARNING OBJECTIVES

Upon completion of this four-week program, participants will be able to successfully:

1. Apply concepts to design, build, maintain, troubleshoot, and repair a substation.
2. Demonstrate an advanced understanding and knowledge of applicable standards, specifications, and regulations such as OSHA, the NESC, and NERC/CIP.
3. Practice safely entering, exiting, and performing maintenance in a substation.
4. Apply advanced concepts of the substation's role in a distribution system including testing and programming.
5. Demonstrate ability to test and program equipment found in a substation, including applicable safety precautions and PPE
6. Demonstrate an advanced understanding of SCADA, as well as switching and tagging.
7. Demonstrate an understanding of how to operate and interpret relay functions.

## PREREQUISITES

To be successful in the Substation II Program, students are expected to participate in the new Basic Electricity and Mathematics for Utility Operations course, as well as successfully complete the Substation I Program.

## SUPPLEMENTAL MATERIALS:

In addition to the printed student manual and a program t-shirt, participants are provided the following supplemental material(s)\*:

1. Calculator
2. Distribution Transformer Handbook
3. UGLY's Electrical Reference

\* Materials are provided in the Apprentice Lineworker, Advanced Lineworker and Substation I Programs and will only be distributed if a student has not already received them.

## TESTING

Weekly Tests (20 Questions); Mid-Term Exam (25 Questions); Final Exam (50 Questions)

## REGISTRATION FEES

Registration fees include coffee and lunch each day. If you have any dietary restrictions or considerations, please make note on your registration.

Members:	\$2,700
Non-Members	\$4,020

## CANCELLATION POLICY

**Cancellations are accepted until Thursday, August 31, 2023.** Substitutions may be made at any time prior to the start of the first session.

Cancellation fees will be charged based on the following schedule:

**2 weeks prior** to the 1<sup>st</sup> scheduled week of class = 100% refund of registration fees

**Before completion of the 1<sup>st</sup> scheduled week** of class = 75% refund of registration fees

**Before completion of the 2<sup>nd</sup> scheduled week** of class = 50% refund of registration fees

**After the 2<sup>nd</sup> scheduled week** of class = 0% refund of registration fees

## INSTRUCTOR

### Tim Richardson, P.E., Technical & Safety Trainer



Tim Richardson joined NEPPA in September of 2019 and has been an asset to the training team. Tim has a long history working in the electric utility industry, including as General Manager of Belmont Municipal Light Department from 1995 - 2007.

Most recently, Tim has worked as Principal of Fundy Power Services, LLC and at Consulting Engineers Group prior to that.

Tim brings a wealth of both technical and safety expertise to the organization and applies his expertise of both in an easy-to-understand and easy-to-learn approach.

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## AGENDA

*Agenda details are subject to change.*

### **Session I – Overview, Substation Operations, Protection (Part I): September 5 - 8, 2023**

#### **Day 1**

8:00 am Welcome & Introductions  
 8:30 am Substation Safety, Switching & Tagging,  
 3-Part Communication  
 9:30 Break  
 9:45 am Substation Safety, Switching & Tagging,  
 3-Part Communication (Cont.)  
 11:30 am Lunch  
 12:00 pm Intro to Substation Design/Bus Types  
 2:30 pm Adjourn

#### **Day 3**

8:00 am **Guest Speaker & Demonstration**  
 11:30 am Lunch  
 12:00 pm Transformer & Bus Protection  
 1:00 pm Transmission Line Protection  
 2:00 pm Adjourn

#### **Day 2**

8:00 am Feeder Protection  
 9:15 am Break  
 9:30 am Overcurrent Protection  
 11:30 am Lunch  
 12:00 pm Overcurrent Protection (Cont.)  
 2:00 pm Adjourn

#### **Day 4 (Virtual)**

8:00 am Review the week  
 9:00 am Break  
 9:15 am Week 1 Test  
 10:30 am Review Exam Results  
 11:00 am Adjourn

### **Session II – Protection (Part 2) and Substation Drawings: September 19 - 22, 2023**

#### **Day 1**

8:00 am Welcome, Introductions & Recap  
 9:00 am Relays – Operation & Interpretation  
 9:45 am Break  
 10:00 am Relays – Operation & Interpretation  
 (Cont.)  
 11:30 am Lunch  
 12:00 pm **Guest Speaker: Relays**  
 2:00 pm Adjourn

#### **Day 3**

8:00 am Logic Diagrams  
 9:15 am Break  
 9:30 am Logic Diagrams  
 10:00 am Hands-On Relay Panels Project  
 11:30 am Lunch  
 12:00 pm Hands-On Relay Panels Project (cont.)  
 2:00 pm Adjourn

#### **Day 2**

8:00 am Elementary Schematics  
 9:45 am Break  
 10:00 am Lockout & Auto-Transfer Schemes  
 11:30 am Lunch  
 12:00 pm Hands-On Relay Panels Project  
 2:00 pm Adjourn

#### **Day 4 (Virtual)**

8:00 am Review the week  
 9:00 am Break  
 9:15 am Week 2 Test  
 10:30 am Review Exam Results  
 11:00 am Adjourn





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## Session III – SCADA/Communications: October 10 - 13, 2023

### Day 1

8:00 am Welcome, Introductions & Recap Weeks 1 & 2  
 8:30 am IEC 6150: What & Why  
 9:45 am Break  
 10:00 am Substation Networks  
 11:30 am Lunch  
 12:00 pm **Guest Speaker:**  
**Advanced SCADA Applications**  
 2:00 pm Adjourn

### Day 2

8:00 am SCADA Systems  
 9:30 am Break  
 9:45 am IED & Relay Communications  
 11:30 am Lunch  
 12:00 pm Hands-On Relay Panels Project  
 2:00 pm Adjourn

### Day 3

8:00 am **Guest Speaker: NERC/CIP**  
 10:00 am Hands-On Relay Panels Project  
 11:30 am Lunch  
 12:00 pm Hands-On Relay Panels Project  
 2:00 pm Adjourn

### Day 4 (Virtual)

8:00 am Review the Week  
 9:00 am Break  
 9:15 am Week 3 Test  
 10:30 am Review Exam Results  
 11:00 am Adjourn

## Session IV – Maintenance / Testing: October 24 - 27, 2023

### Day 1

8:00 am Welcome, Introductions & Recap  
 9:00 am Transformer Testing & Results  
 10:00 am Break  
 10:15 am Transformer Testing & Results (cont.)  
 11:30 am Lunch  
 12:00 pm Hands-On Relay Panels Project  
 2:00 pm Adjourn

### Day 2

8:00 am Breaker Testing & Results (HV Breaker vs. MV Breaker)  
 9:45 am Break  
 10:00 am Breaker & MV Switchgear Bus Testing & Results (cont.)  
 11:30 am Lunch  
 12:00 pm Other Common Tests: Recap of Equipment Testing (CTs/VTs, Arresters, etc.); Circuit/Lockout Verification; Ground Grid Testing  
 2:00 pm Adjourn

### Day 3

8:00 am Miscellaneous Systems  
 10:30 am Hands-On Relay Panels Project  
 11:30 am Lunch  
 12:00 pm Presentation of Relay Panels Project  
 2:00 pm Adjourn

### Day 4 (Virtual)

8:00 am Final Recap of Weeks 1 – 3  
 9:45 am Break  
 10:00 am Final Exam  
 11:15 am Certificates of Completion  
 11:30 am Adjourn





**NEPPA's Student Scholarship Fund**

**University / Trade School Students:**

- One Scholarship directed at students currently enrolled in college or trade school program during 2023/2024 program year.

**Graduating High Schools Seniors:**

- One Scholarship directed at students who are seniors in high school during the 2023/2024 school year.
- Recipients should be enrolling in college or trade school program upon HS graduation
- Application deadline March 29th, 2024
- Winner announced May 1st, 2024.
- Amount: \$500.00 per scholarship winner
- Application criteria: High School/University GPA, High School/University curriculum, extracurricular activities, short essay, community involvement.
- Student must be served by NEPPA utility (NEPPA family members encouraged to apply)

SCHOLARSHIP @NEPPA.ORG

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## Support NEPPA's Benevolent Fund



Every day, public power utilities are engaged in the demanding and often dangerous task of providing safe, reliable electric power to their communities at the lowest possible cost. As with any large family, the New England public power community is sometimes faced with unexpected tragedies: disabling accidents, sudden and prolonged illnesses, and even the tragic loss of life.

To Support the Benevolent Fund:

You can purchase merchandise or give directly to the fund go to [www.neppa.org](http://www.neppa.org) to purchase online. You may mail a check or call the office to process a credit card over the phone. All donations will directly go into the Fund.

NEPPA's Benevolent Fund was established to continue the tradition of providing support and resources in times of need. All funds raised and received are designated to be disbursed to public power employees, or their families, undergoing financial difficulties due to personal injury, illness, or death.





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